

# PATENT SPECIFICATION

(11) 1208725

1208725

## DRAWINGS ATTACHED

- (21) Application No. 50074/66 (22) Filed 8 Nov. 1966
- (21) Application No. 51212/67
- (62) Divided out of No. 1 208 724
- (23) Complete Specification filed 8 Nov. 1967
- (45) Complete Specification published 14 Oct. 1970
- (51) International Classification G 05 g 1/10
- (52) Index at acceptance

F2L 36  
F2U 224 226 236 239 334 362 366 368 374 377 386  
H3Q 6K 6P

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## (54) IMPROVEMENTS IN OR RELATING TO SPINDLE STOP ARRANGEMENTS

(71) We, THE PLESSEY COMPANY LIMITED, a British Company of 56 Vicarage Lane, Ilford, Essex, do hereby declare the invention, for which we pray that a patent may be granted us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to stop arrangements for rotating spindles or shafts and has especial application to stop arrangements for the spindles of rotating switches or variable electrical devices (e.g. variable resistors).

Hitherto it has been the practice to employ stop arrangements which are preset to provide what is for practical purposes a permanent stop setting. The present invention is directed to a stop arrangement which enables the stop setting or settings to be modified as desired without the need for altering the position of any permanent fixtures of the stop arrangement.

According to the present invention we provide a spindle stop arrangement in which there is provided a knob affording on its underside a generally annular cavity arranged for receiving an outstanding lug of a member securable to a support structure and with respect to which said knob is rotatable, said cavity having associated with it at selected angular positions therearound, one or more stop members for co-operation with said lug to limit the angular displacement of the knob and thus the angular displacement of the spindle to which the knob will be attached, said stop member or members, or said lug being positionally adjustable in predetermined angular increments whereby a limit of the said angular displacement is defined.

In one embodiment of the invention the opposed walls of the knob defining the annular cavity may be formed with radially aligned grooves or slots which are arranged for slid-

ingly receiving stop plate members the planes of which extend in radial directions.

The angular positions of the stop plates can thus be changed in order to vary the stop positions for the knob according to requirements.

A number of embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a part sectional view of a knob with a spindle stop arrangement according to the invention;

Figure 2 is a view of an adjustable stop member of the arrangement according to Figure 1;

Figure 3a is a part sectional view of a knob with a further spindle stop arrangement according to the invention;

Figure 3b shows a castellated washer of the embodiment shown in Figure 3a;

Figure 3c shows an adjustable stop member which engages with the castellated washer of Figure 3b;

Figure 4 shows an underside view of a knob with yet another form of spindle stop arrangement; and

Figure 5 is a sectional view taken along the sectional line AA of Figure 4 coupled with a sectional view of an insert which co-operates with the knob of Figure 4;

In Figures 1 and 2 two castellated stop rings 1, each having a radially outwardly extending lugs 2, are shown to be interlockingly engaged with castellations 3 of an inner skirt 4 of a knob 5 which is preferably formed from a thermoplastics material. The stop rings 1 are securely held in position on the base of skirt 4 by a spring clip 6 which engages in radial slots 7 in the castellations 3.

The knob 5 is fixed relative to a spindle 9 by engagement of a rectangular bar 10 with

a diametral slot 111 in the end of the spindle 9, and by engagement of claws 12 of flexible legs 12a with a circumferential groove 13.

The spindle stop arrangement may be 5 mounted on a support member 14, and is securely held in position by a retaining nut 15 which screws on to a screw shank 16 having two diametrically opposite flat surfaces (not shown). The nut 15 also serves to clamp to 10 the support member 14 a stop ring 17 having an upstanding portion 17a, the stop ring being locked rotationally to the screw shank 16 since the internal periphery of the stop ring 17 has flat surfaces which co-operate with those of 15 the screw shank 16.

For the purpose of setting the spindle stop arrangement, when it is known what particular angle of rotation is required for the knob and spindle, the spring clip 6 is released and the 20 stop rings 1 positioned on the castellations 3 in order that the portion 17a of the stop ring 17 may engage with the lugs 2, one at either end of the angle through which the spindle 9 is to be rotated relative to the fixed support 25 member 14.

Figure 3a shows a further embodiment of the invention, in which parts similar to those hereinbefore described retain the same reference numerals.

The knob 18 has an integral abutment 19 which engages with an upstanding part 20a of a stop ring 20, the knob 18 being locked to the spindle 9 in a manner similar to that hereinbefore described.

The knob and spindle assembly may be 30 mounted on a support member 14 and held securely in position by the nut 15 screwed on to the screw shank 16. The nut 15 also serves to retain a castellated washer 21 which can best be seen in Figure 3b, which is prevented 40 from rotating about the screw shank 16 by means of co-operating flat surfaces on the shank 16 (not shown) and on the internal periphery 22 of the castellated washer 21.

As can be appreciated from Figures 3b and 45 3c the stop ring 20 has the upstanding part 20a thereof located between one pair of adjacent castellations 21a of the castellated washer 21 so that the stop ring 20 is restrained rotationally in one angular position. It will be clear 50 that this position may readily be modified to modify the stop position of the knob and spindle assembly simply by arranging that the part 20a is moved from between one pair of castellations 21a to between another pair of such 55 castellations.

The spindle 9 may therefore be rotated 60 through an angle determined by the angular position of the stop ring 20 engaging with the abutment 19 on the knob 18.

Referring now to Figures 4 and 5 the knob 65 shown comprises an outer part 30 of rigid plastics material such as rigid nylon which may be injection moulded for example. This outer part 30 is formed on its underside with an

annular cavity 31 which is provided for receiving an outstanding lug (not shown) of a stop structure associated with the spindle to which the knob is to be attached. Opposed cylindrical walls 32 and 33 defining the annular cavity 31 are formed with radially aligned axially extending slots or grooves 34 and 35 for slidably receiving metal stop plates, such as those plates indicated at 36 and 37 in the present example. It will of course be appreciated that one or more stop plates may be located in selected aligned slots to provide a requisite stop position or positions for the knob according to requirements and stop positions may readily be modified simply by withdrawing the stop plate or plates and inserting these into different slots.

The knob part 30 is also formed with a central generally cylindrical cavity 38 which has a splined wall 39. This cavity 38 is constructed for receiving an inner knob part 40 which may be of plastics material (e.g. pliable nylon).

The inner knob part 40 serves to attach the knob part 30 in a predetermined angular position relative to the spindle depending upon the angular rotation to be indicated by the pointer or beak 41 of the knob part 30. The inner knob part 40 has splines 42 complementary to those of the splined wall 39 for positioning the knob part 30 for correct angular rotation. The principle of providing an inner knob part in order to afford variable angular positioning of the knob relative to the spindle is described in our co-pending patent application No. 50073/66. (Serial No. 1,208,724).

In order to positively prevent the knob assembly from being removed from the spindle the knob may be fixedly attached to the spindle by means of a screw (not shown) which passes through a central hole 44 in the knob part 30 and threads into a threaded hole provided in the end of the spindle.

These embodiments have been given by way of example only and a number of modifications may be made without departing from the invention. For instance, in the first embodiment it is possible to have one adjustable stop ring 1 arranged to engage with one or more stop rings 17. In the second embodiment two adjustable stop rings 20 may be used, each being engageable with the abutment 19, or alternatively, two abutments 19 may be used to co-operate with one adjustment stop ring 20.

#### WHAT WE CLAIM IS:—

1. A spindle stop arrangement in which there is provided a knob affording on its underside a generally annular cavity arranged for receiving an outstanding lug of a member securable to a support structure and with respect to which said knob is rotatable said cavity having associated with it at selected angular positions therearound one or more stop members for co-operation with the lug to limit the angular displacement of the knob and thus the an-

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gular displacement of the spindle to which the knob will be attached, said stop member or members, or the said lug, being positionally adjustable in predetermined angular increments whereby a limit of the said angular displacement is defined.

5. A spindle stop arrangement as claimed in claim 1 in which opposed walls of the knob defining the annular cavity are formed with a pair of radially aligned grooves or slots for slidingly receiving a stop plate member.

10. A spindle stop arrangement as claimed in claim 1 wherein the said knob includes on its underside castellations engaged with the complementary parts of a pair of castellated rings each of which includes a stop prong, the position of the stop prongs relative to each other being adjustable in angular increments determined by the castellations.

4. A spindle stop arrangement as claimed in claim 1 wherein the said outstanding lug of said member engages with castellations of a fixed member which is fixed relative to the support structure, a limit of the said angular displacement being determined in accordance with the positional relationship between said member and said fixed member.

20. 5. A spindle stop arrangement substantially as hereinbefore described with reference to Figures 1, 2, 3a, 3b and 3c of the accompanying drawings.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1970.  
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from  
which copies may be obtained.

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3 SHEETS This drawing is a reproduction of  
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Sheet 1

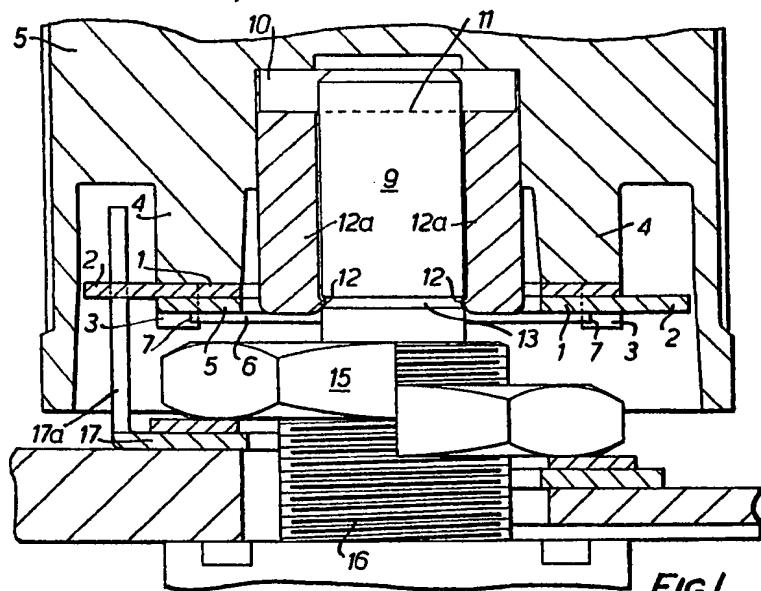


FIG. 1.

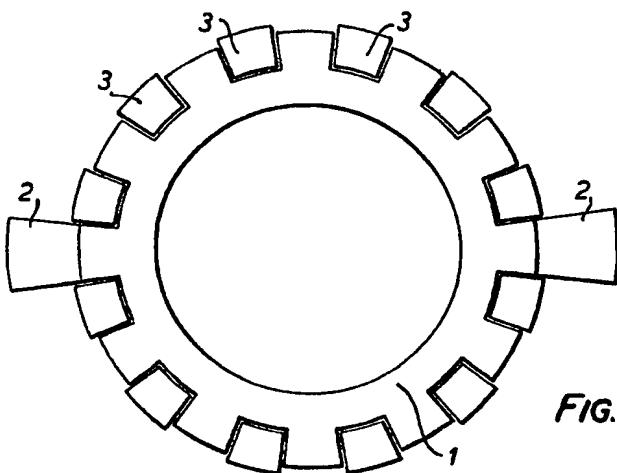


FIG. 2.

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Sheet 2

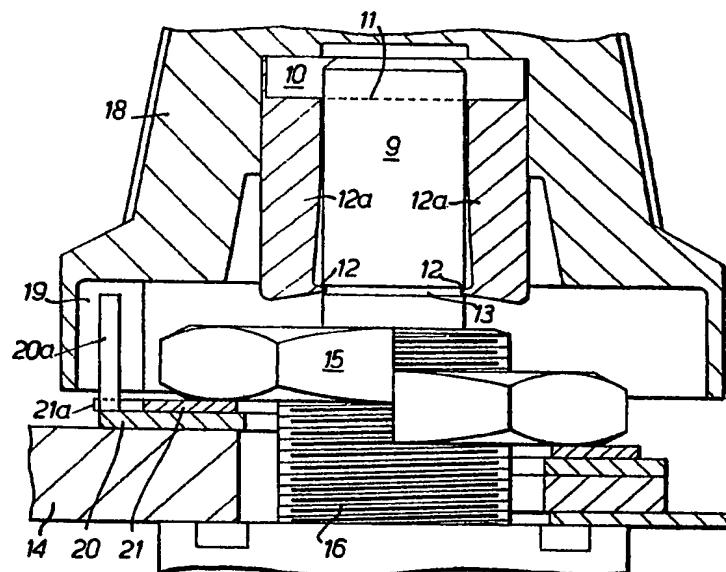


FIG. 3a.

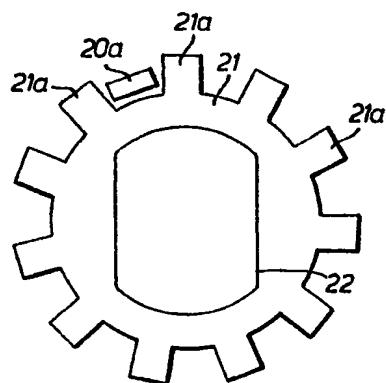


FIG. 3b.

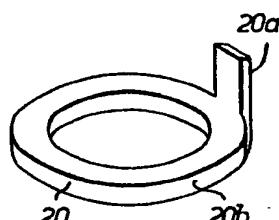


FIG. 3c.

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Sheet 3

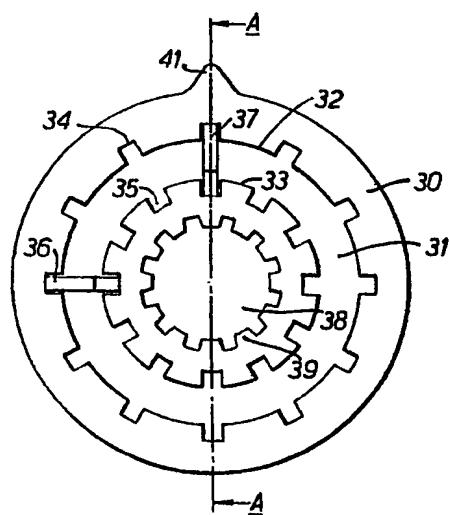


FIG. 4.

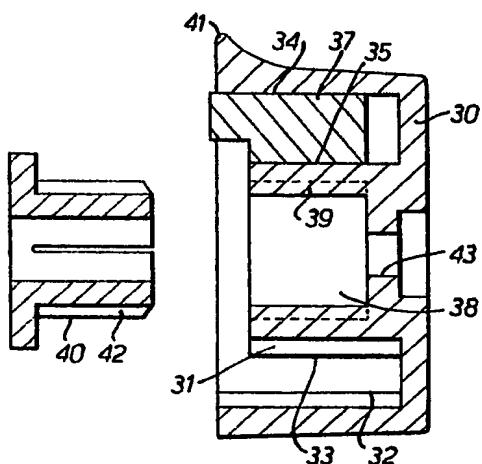


FIG. 5.